

XV. *Some remarks on the Coccid genus Leucaspis, with descriptions of two new species.* By E. ERNEST GREEN, F.E.S.

[Read October 7th, 1914.]

PLATES LXVII, LXVIII.

THE following species have, at various times, been allotted to the genus *Leucaspis*:—*affinis*, Leon.; *bambusae*, Kuw.; *candida*, Targ.; *cockerelli*, de Charm.; *cordylinidis*, Mask.; *corsa*, Lind.; *cupressi*, Coleman; *ephedrae*, March.; *epidaurica*, Genn.; *gigas*, Mask.; *indica*, Marlatt; *indiae-orientalis*, Lind.; *japonica*, Ckll.; *kelloggi*, Coleman; *kermanensis*, Lind.; *leonardi*, Ckll.; *loewi*, Colvée; *monophylla*, Murray; *pini*, Hartig; *pistaciae*, Lind.; *pusilla*, Loew; *riccae*, Targ.; *signoreti*, Targ.; *stricta*, Mask.; and *sulci*, Newst.

These twenty-five names have since been considerably reduced in number, partly by allocation to other genera and partly by suppression as synonyms. These changes in nomenclature have been put forward by Leonardi and Lindinger (not always in complete agreement) in two useful papers published in 1906, viz. Leonardi "Saggio di Sistematica delle Leucaspides," *Anneli di Agr.*, vi; and Lindinger, "Die Schildlausgattung *Leucaspis*," *Jahr. Hamb. wiss. Anst.*, xxiii.

L. affinis, of Leonardi, in the opinion of Lindinger, is a synonym of *candida*, which—in its turn—is suppressed by Leonardi as equivalent to *pini*. Leonardi distinguishes his species from *pini* by its smaller size and the fewer number of glandular pores outside the anterior spiracles. Lindinger, however, disputes the authenticity of *L. pini* of Hartig.

L. bambusae, of Kuwana, is relegated by Lindinger to the genus *Lepidosaphes* (*Mytilaspis* of Signoret). Kuwana's figures of his species (*Pr. Cal. Ac. Sci.*, 3, iii, Pl. XIII, figs. 75–81) show unmistakably that it cannot be included in *Leucaspis*; but, in the absence of male puparia, it might be assigned, with equal justice, to either of the two genera *Lepidosaphes* or *Chionaspis*.

L. candida, Targ., as noted above, has been alternately extinguished and rehabilitated, by Leonardi and Lindinger respectively. The latter author is convinced that, in describing *Aspidiotus pini*, both Hartig and Bouché were dealing with a different insect, and he accordingly adopts the name *candida* of Targioni as the earliest definition of the species attributed by later writers (Signoret, Berlese and Leonardi) to *pini*.

L. cockerelli, of de Charmoy (originally described under the generic name *Fiorinia*), is a very distinct species about which there can be no question.

L. cordylinidis, of Maskell, appears to be rightly placed in this genus. Maskell's description of the female puparium as having the "pellicles terminal, small," is misleading. Examples in my collection (received from Maskell himself) show that the nymphal pellicle has the characters of typical *Leucaspis*, being large, concealed beneath the secretionary covering, and completely enclosing the body of the adult female.

L. corsa, of Lindinger, was subsequently recognised by that author as being equivalent to *signoreti*.

L. cupressi, Coleman. The author's description and figures (Jn. N. Y. Ent. Soc., xi, p. 71) are sufficient proof that this insect is not a *Leucaspis*. It is probably correctly allocated (by Lindinger) to the genus *Lepidosaphes*.

L. ephedrae, Marchal, appears to be a well-defined species.

L. epidaurica, of Gennadius, has been shown by Leonardi and Lindinger to be equivalent to *riccae* of Targioni.

L. gigas, of Maskell, originally described as a *Fiorinia*, has been correctly relegated, by Lindinger, to the present genus.

L. indica, Marlatt, has characters that sufficiently distinguish it from all other members of the genus.

L. indiae-orientalis, Lind. Judging by the figures given by Dr. Lindinger, this species must be very near to his *kermanensis*. They both occur in the Oriental region; but the striking difference in the food-plant (*indiae-orientalis* affecting *Pinus*, while *kermanensis* occurs on the *Salix* tribe) suggests that the similarity must be more apparent than real.

L. japonica, Ckll. This is recognised, by both Leonardi and Lindinger, as a good species; but, after comparison with typical examples of *riccae*, it appears to me to be

rather doubtfully distinct from that species. The characters of the adult females are, as far as I can see, identical. The most noticeable difference is in the form of the pygidial lobes of the nymphal pellicle, which are conspicuously tricuspid in *japonica* (see fig. 7), while in *riccae*—though varying to a certain extent—the margin of the lobes is comparatively entire. Originally described from Japan, the species has since been recorded from Brazil. I have also received it from India, where it occurs on *Ficus religiosa*. (See further particulars below.)

L. kelloggi, Coleman. Coleman's species, as pointed out by Lindinger, has none of the characteristics of the genus *Leucaspis* and is probably referable to *Lepidosaphes*.

L. kermanensis, of Lindinger, is characterised by the comparatively simple margin of the pygidium of the adult female, which is without either plates or prominent lobes. As noted above, the same author's *indiae-orientalis* approaches this species very closely. In *salicis*, mihi (described below), a similar condition occurs.

L. leonardi, Ckll. This is now recognised, by both Leonardi and Lindinger, as a synonym of *pusilla*.

L. loewi, Colvée. Both Leonardi and Lindinger agree in regarding *loewi* and *sulci* as representing a single species; but they differ in their opinion as to which of the two names should be retained. While Leonardi accepts *loewi* as the older name, Lindinger disputes its authenticity and adopts Newstead's name—*sulci*.

L. monophylla, Murray. Little seems to be known about this insect, except that it was recorded as occurring on pine trees in Europe. Lindinger places it on his list, with a query. Mrs. Fernald relegates the name to her list of "species without description or not recognisable," and adds a note—on the authority of Cockerell—that it is "probably a *Monophlebus*."

L. pini, Hartig. This name—as regards its synonymy with *candida*, Targ.—is in the same position as *loewi* with *sulci*. Leonardi accepts *pini*, while Lindinger rejects that name and adopts *candida*.

L. pistaciae, of Lindinger, is well characterised by the single pair of large median lobes on the pygidium of the adult female.

L. pusilla, Loew, shows a curious variability of the marginal fringe. The plates may be either spatulate, or irregularly serrate, or both conditions may occur together.

The lobes may be asymmetrically disposed, one or more of them being often missing. The median plates are occasionally fused together, as represented in Leonardi's figure.

L. riccae, Targ., is undoubtedly a good species. Even should it prove to be identical with *japonica*, the name *riccae* has priority.

L. signoreti, Targ. The authenticity of this name remains undisputed.

L. stricta, Mask. Originally described as a *Fiorinia*, this insect has been justly relegated to the genus *Leucaspis* by Leonardi, in which decision he is followed by Lindinger.

L. sulci, Newst. This species also originally figured under the genus *Fiorinia*. It is now recognised as equivalent to *Leucaspis loewi*; but, as noted in my remarks upon that species, there is a question as to which specific name should be retained.

To the above catalogue I now propose to add two new names, viz. :—

- L. perezii*, from Pinus, in the Canary Islands; and
L. salicis, occurring on Salix: Beloochistan.

Detailed descriptions of these two species appear below.

Eliminating synonyms and disputed names, we have the following seventeen species remaining in the genus :—

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|---|--|
| 1. <i>indiae-orientalis</i> , Lind. | } six
species,
affecting
Pinus. |
| 2. <i>loewi</i> , Colvée (= <i>sulci</i> , Newst.) | |
| 3. <i>perezii</i> , Green. | |
| 4. <i>pini</i> , Hartig (= <i>candida</i> , Targ. = <i>affinis</i> , Leon.) | |
| 5. <i>pusilla</i> , Loew (= <i>leonardi</i> , Ckll.) | |
| 6. <i>signoreti</i> , Targ. (= <i>corsa</i> , Lind.) | } three species, on various Mono-
cotyledons. |
| 7. <i>cockerelli</i> , de Charm. | |
| 8. <i>cordylinidis</i> , Mask. | |
| 9. <i>stricta</i> , Mask. | } eight species, on
various
Dicotyledons. |
| 10. <i>ephedrae</i> , March. | |
| 11. <i>gigas</i> , Mask. | |
| 12. <i>indica</i> , Marlatt. | |
| 13. <i>japonica</i> , Ckll. | |
| 14. <i>kermanensis</i> , Lind. | |
| 15. <i>pistaciae</i> , Lind. | |
| 16. <i>riccae</i> , Targ. (= <i>epidaurica</i> , Genn.) | |
| 17. <i>salicis</i> , Green. | |

Leonardi divides the genus into three subgenera, which he defines as follows:—

- I. Pygidium furnished with “pectines” (= “plates,” of Comstock).
 - A. Pygidium with “trullae” (= “lobes”) *Leucaspis* (s. str.).
 - B. Pygidium without “trullae” . . . *Anamaspis*.
- II. Pygidium without “pectines” . . . *Actenaspis*.

His *Anamaspis* was erected to contain the single species *loewi* (= *sulci*), but would now include *indiae-orientalis*, *kermanensis*, *pistaciae* and *salicis*.

His *Actenaspis* was similarly made to contain a single species—*pusilla*. He designates the marginal processes of this species by the term “appendices,” differentiating them from the “pectines” attributed to the species that he restricts to *Leucaspis*. I fail to see in what essential particular these processes on the pygidium of *pusilla* differ from those of *pini*, or *signoreti*. They arise in the same manner and from the same area in all three species, and I hold them to be strictly homologous structures.

Leucaspis perezii, sp. nov.

Puparium of female narrow, of normal form: consisting of the blackish larval and nymphal pellicles thinly veiled by a white secretory covering which extends as a narrow border surrounding the nymphal pellicle. Length 1·25 to 1·8 mm.; the average length being approximately 1·5 mm. Larval pellicle dark brown, brownish-ochreous at the anterior and posterior extremities. Nymphal pellicle black or very dark brown, paler at posterior extremity. Length of nymphal pellicle 1·15 to 1·5 mm.; average length of 20 examples 1·28 mm.

Male puparium white: larval pellicle dark olivaceous brown. Length 1·5 to 2 mm.

Adult female (fig. 1) of normal form, narrowing to the rounded cephalic extremity; widest across abdomen the sides of which are broadly rounded and constricted rather abruptly at the base of the pygidium. Rudimentary antennae conspicuous, consisting of a chitinous tubercle surmounted by from 3 to 4 stout spine-like setae. Tentorium very large and conspicuous. Anterior spiracles situate close to tentorium; posterior spiracles at junctions of thoracic and abdominal areas; the two pairs widely separated. A small group of from 5 to 6 parastigmatic pores above the anterior spiracles. In

many examples there is a well-marked rugose thickening of the derm on the median dorsal area. Pygidium rounded. Anal aperture surrounded by a circumscribed thickened area. Dorsal surface of pygidium longitudinally rugose; with eight irregular oblong patches of denser chitin. All these denser areas are rendered more conspicuous by their taking a deeper stain than the surrounding parts. Circumgenital glands in a scattered arch, containing a variable number of (from 30 to 45) pores: the average of twenty examples giving 39. Margin of pygidium (fig. 2) with six narrow lobes which taper to a blunt point. Marginal processes long and slender, spatulate, extending twice the length of the lobes: 2 between median lobes, 2 between median and first lateral, 3 between first and second laterals, and from 7 to 10 beyond the second lateral lobe. There is a long and slender marginal spine after the first marginal process, in the interspace between the two lateral lobes, and another after the second or third process beyond the outer lateral lobe: other smaller spines at intervals, and an irregular sub-marginal series of about 20 small spines on conspicuous circular bases. Length 0·65 to 0·8 mm.

Adult male not observed.

The nymphal pellicle (fig. 3) shows the following peculiarities. The cephalic area is strongly demarked and bears a central scar of definite and constant form, as shown in figure. The rostrum is disposed immediately below the centre of the body. The pygidium has a sharply defined disc separated from the marginal area and bearing about 14 conspicuous dorsal pores. The margin (fig. 4-a) displays 4 lobes, widest at extremity. In each interspace between the lobes is a single large lunate pore from which arises a pair of broad fimbriate squames, and a varying number of similar pores (of which 4 are usually larger and more conspicuous) beyond the lobes on each side. In older examples the marginal characters are partially obscured.

Habitat, on *Pinus halepensis* and *P. canariensis*: Santa Ursula, Teneriffe, Canary Islands. Collected by Dr. Perez, to whom the species is dedicated.

Leucaspis perezii most nearly resembles *L. pusilla* of Loew. The puparium is of small size, as in that species, but is much darker in colour, the pellicles being blackish instead of fulvous. The pygidial processes of the adult female are of very much the same character in the two species, but—in *perezii*—are more constant in number and more uniformly spatulate in form. The most noticeable differences occur in the nymphal pellicle, as may be

appreciated by reference to figs. 3, 4-*a*, 4-*b*, and 5. These differences are further shown in the annexed comparative table :—

Nymphal pellicle.	<i>perezi</i> .	<i>pusilla</i> .
Length . . .	1·15 to 1·5 mm.	1·0 to 1·15 mm.
Average length .	1·28 mm.	1·06 mm.
Cepalic extremity	Strongly demarked : with conspicuous scar	Not demarked : with- out scar.
Rostrum . . .	Approximately cen- tral	Much nearer pos- terior extremity of body.
Pygidium . . .	With sharply defined median disc	Median disc ill-de- fined.

The pellicle of *pusilla* (fig. 5) is shorter but proportionately broader; the large lunate pores and marginal incisions are conspicuous almost to the base of the pygidial area, there being usually 9 of them beyond the lateral lobe; while, in *perezi*, not more than 4 are clearly noticeable in the corresponding position, the remainder being obscured by a thickening of the margin.

Leucaspis salicis, sp. nov.

Female puparium comparatively short and broad. Pellicles dark brown : larval pellicle exposed : nymphal pellicle thinly veiled by a greyish-white secretory covering which extends slightly beyond the margins of the pellicle itself. Length 1·0 mm. Breadth 0·65 mm.

Male puparium ochreous white, the single pellicle ochreous. Proportionately narrow. Length 1·0 mm. Breadth 0·45 mm.

Adult female enclosed within the nymphal pellicle : broadly oval (fig. 10), constricted at base of pygidium. Rudimentary antennae with 3 or 4 stout setae. Rostrum large and conspicuous. Anterior spiracles close to the rostrum, one on each side : one or two isolated pores representing the parastigmatic glands. Pygidium (fig. 11) with 4 very small and inconspicuous lobes which scarcely project beyond the margin and are often quite indistinguishable. There are no fimbriate squames or marginal fringe of any kind ; but a few minute spines, on circular bases, are set at intervals along the distal half of the pygidium. Anal orifice rather inconspicuous, central. Circumgenital glands in a scattered row (containing about

24 pores) across the base of the pygidium. An isolated pore on each side of each of the two preceding segments. Length 0.45 to 0.5 mm. Breadth 0.3 to 0.4 mm.

Nymphal pellicle (fig. 12) rather broadly oval, narrowed behind. Often with an irregular fold demarking the cephalic area. Rostrum occupying a position immediately behind the centre of the body. Abdominal segments well defined by transverse folds. Extremity of pygidium (fig. 13) with a single median pair of large broad chitinous lobes of irregular form. Two lunate marginal pores are noticeable on each side, at some little distance from the median pores, at which point the series is diverted inwards. Length of pellicle 0.75 mm. Breadth 0.5 to 0.6 mm.

Habitat, on stems, branches and twigs of willow (*Salix* sp.): Mushki, Beloochistan. Collected by Mr. V. Iyer, of the Forest Research Institute, Dehra Dun. The scales are so thickly massed on the bark that they must seriously affect the health of the plant.

The character of the pygidium of the adult female suggests close affinity with *L. kermanensis*, of Lindinger, which also occurs on *Salix*, in Persia; but the pygidial margin of the nymph of that species (as figured in Lindinger's paper) displays two pairs of comparatively narrow lobes and many stout conical processes, while that of *salicis* is furnished only with a single median pair of extremely broad lobes. Unfortunately, I have been unable to procure typical examples of *kermanensis*, for comparison.

Leucaspis japonica, Ckll.

Cockerell's account of this species (*Psyche*, viii, p. 53, 1897) refers to the nymphal insect only.

Leonardi was unable to obtain the adult form, material received from the author of the name being in bad condition.

Lindinger appears to have been more successful, as he describes and figures all three stages of the insect. These figures have enabled me to identify as *japonica* a *Leucaspis* collected by Dr. Annandale on *Ficus religiosa*, in India. The following notes are drawn up from these Indian examples.

The nymphal pellicle (fig. 6) shows a more or less symmetrical division into median and lateral series of chitinous plates which are more complete on the hinder segments. The rostrum which, in the example figured, is shown above

the middle, is usually displaced to a position much nearer the posterior extremity of the body. The four pygidial lobes are conspicuous and prominent, each distinctly trilobulate (fig. 7). Length of pellicle 1.25 to 1.5 mm.

Lindinger describes the nymph as possessing, on each side of the pygidium, a small group of pores similar to those of the circumgenital glands of the adult female. I have failed to find these organs on the nymphal pellicles of my Indian examples; but they show a small group of oval dorsal pores occupying the position indicated in Lindinger's figure.

My examples of the adult female show a longitudinal series of small conical tentacular processes on each side, on a fold embracing the rostrum and the two pairs of spiracles (fig. 8). These do not appear to have been noted by previous observers. The rostral apparatus is unusually large and conspicuous. In addition to the circumgenital series of glands, there are two small supplementary groups (of from 4 to 5 pores) on each side, situated respectively on the two preceding abdominal segments. The pygidial lobes are stout and lanceolate: the marginal fimbriate plates long and slender (fig. 9).

I have examined two separate gatherings, labelled respectively "on twig of *Ficus religiosa*, associated with *Lecanium nigrum*, Calcutta, Jan. 1896," and "on Popul tree, Rajmahal, Bengal." In the former, the puparia are of a dirty greyish-white colour, while in the latter they (both male and female) are stained of a reddish tint assimilating them to the colour of the bark to which they are attached. Cockerell describes his examples as being "whitish with a strong greyish-ochreous tinge, exactly the colour of the twig on which they rest." It would appear therefore, that the insect has the power of altering the tint of its secretions to match its surroundings.

EXPLANATION OF PLATES LXVII, LXVIII.

PLATE LXVII.

FIG.

- | | | |
|------|----------------------------|---|
| 1. | <i>Leucaspis perezii</i> , | adult female, $\times 72$. |
| 2. | „ | pygidium of adult female, $\times 458$. |
| 3. | „ | pellicle of nymph, $\times 72$. |
| 4-a. | „ | posterior margin of nymphal pellicle,
$\times 260$. |
| 4-b. | <i>Leucaspis pusilla</i> , | posterior margin of nymphal pellicle,
$\times 260$. |
| 5. | „ | nymphal pellicle, $\times 72$. |

PLATE LXVIII.

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|-----|-----------------------------|---|
| 6. | <i>Leucaspis japonica</i> , | nymphal pellicle, $\times 58$. |
| 7. | „ | posterior margin of nymphal pellicle,
$\times 258$. |
| 8. | „ | adult female, $\times 120$. |
| 9. | „ | pygidium of adult female, $\times 258$. |
| 10. | <i>Leucaspis salicis</i> , | adult female, $\times 70$. |
| 11. | „ | pygidium of adult female, $\times 258$. |
| 12. | „ | nymphal pellicle, $\times 70$. |
| 13. | „ | posterior margin of nymphal pellicle,
$\times 450$. |